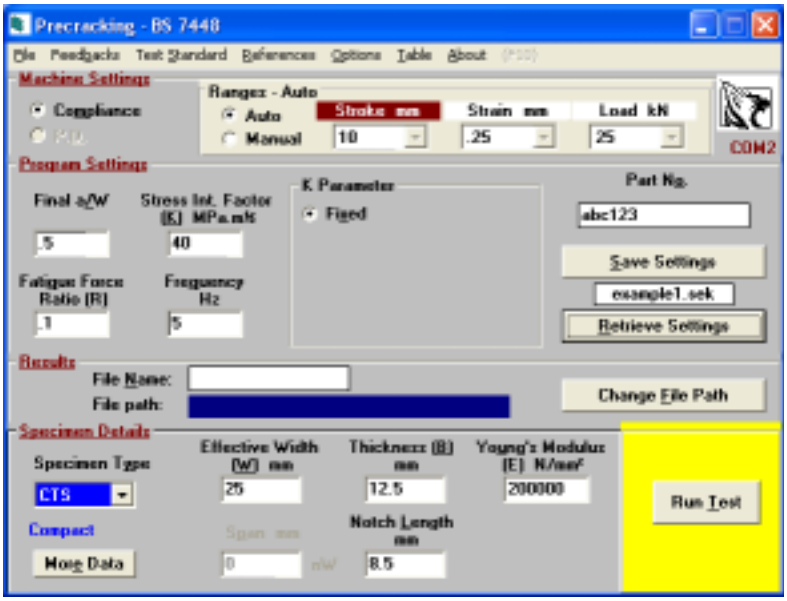
Precracking Instruction Manual

Document MA9_1 Date 15/09/08



Phoenix Calibration & Services Ltd

Brick Kiln Street, Harts Hill, Brierley Hill,

West Midlands, DY5 1JG,

UNITED KINGDOM

Tel. No. +44 (0)1384 480545

Fax No. +44 (0)1384 480602

E-mail: sales@phoenixcalibration.co.uk

Web site: http://www.phoenixcalibration.co.uk

Trademark acknowledgements

MS-DOS and Microsoft Windows are trademarks of Microsoft Corporation.

IBM is a trademark of the International Business Machines Corporation.

CONTENTS

Page

1. INTRODUCTION 2
2. RUNNING THE PROGRAM - AN EXAMPLE 3
3. THE MAIN SCREEN 9
   - Save Settings and Retrieve Settings 9
   - Compliance / P.D. 10
   - Ranges 10
   - Final a/W 10
   - Fatigue Force Ratio (R) 10
   - Stress Intensity Factor (K) 10
   - Frequency 10
   - K Parameter 11
   - Part No. 11
   - File Name 11
   - Specimen Type 11
   - Effective Width (W) 11
   - Thickness (B) 11
   - Notch Length 11
   - Span 11
   - Young's Modulus, E 11
   - More Data -> Specimen Parameters 12
   - Run Test 12
4. THE MAIN SCREEN MENU BAR 13
   - File menu 13
   - Feedbacks menu 13
   - Test Standard menu 13
   - References menu 13
   - Options menu -> Preferences -> Loading Rate 14
   - Table menu 14
   - About menu 14
5. APPENDIX 1 - AN INTRODUCTION TO WINDOWS 15
6. APPENDIX 2 - AN EXAMPLE RESULTS FILE 17

1. INTRODUCTION

This manual describes the operation of the Phoenix Services Precracking Program which is one part of a three program suite for Fracture Mechanics testing to standards including BS 7448 Part 1 1991. The other two programs in the suite are the Fracture and Analysis programs. The Precracking Program is used to grow a precrack in the specimen, after which the Fracture Program loads the specimen to final fracture or plastic collapse. Finally the Analysis Program uses the results obtained from the first two tests to calculate the opening mode plane fracture toughness (K_{Ic}), critical crack tip opening displacement (CTOD), or critical J fracture toughness values of the specimen. The software may be used with either Compact Tension Specimens (CTS) or three-point bend Single Edge Notch (SEN) specimens.

Although the three programs are designed to work as an integrated suite, each may be used separately with data from other sources which provides for maximum flexibility.

The Precracking Program displays the test status while running, with the cycle count, a/W, and running crack length continuously updated on the screen (see figure 3). The test results and specimen parameters may be printed for record purposes. The test results data are placed in a standard comma-separated variable (CSV) format ASCII file which may easily be imported into other programs such as spreadsheets, word processors, or data analysis packages. These results are also imported into the Fracture and Analysis parts of the Fracture Mechanics suite of programs to produce one final file with all the specimen test results and analysis incorporated.

Working in conjunction with a Phoenix Services Control System and servo-hydraulic testing machine, the Precracking Program is compatible with a wide range of load-frames and extensometry.

All Phoenix Calibration Services applications programs are designed to run within the Windows environment on an IBM compatible personal computer.

2. RUNNING THE PROGRAM - AN EXAMPLE

The Precracking Program has many possible options which are explained in detail in the sections which follow. In order to familiarise the user with the basic principles of the software, this example section describes a typical test which might be performed. While it may not correspond exactly to your own testing methods, please read this section carefully. The small amount of time required will give the new user a good overview of the features available and how to run the software.

Because the program cannot be used without a specimen which will be damaged by the test, the use of scrap specimens during familiarisation is recommended. Without a specimen the main screen parameters may still be entered up to the point at which the test is started.

Once Windows is running, start the program by selecting it from the Start button -> All programs -> Phoenix Services -> FMA Precracking or double click the FMA Precracking icon on the desktop.

If the Virtual Control Panel (VCP) is already running the Precracking Program will use it to check the control system parameters. If VCP is not running it will be started automatically. Since the Precracking Program performs actual tests in conjunction with the testing machine, it will not run unless it is able to communicate with the control system. For the link to operate, ensure that the “Local / Remote” switch on the back of the control system display unit (if fitted) is switched to “Remote”. Once a test is running it is essential that this switch is left unchanged. Switching back to local control and changing control system parameters manually (rather than via the computer) may mean that the computer software uses incorrect values with consequent risk of wrong results or damaged specimens.

Once the program is running the computer will spend a few seconds communicating with the control system to check system parameters. When it has finished, the Main Screen of the Precracking Program appears as shown in figure 1 (but without the parameters entered).

Windows programs are almost always used with a pointing device such as a mouse, but they may also be controlled using the keyboard, and this can sometimes be a faster way to enter parameters. To select parameter entry boxes without a mouse, the tab key can be used to select each in a repeating sequence. The Main Screen entries will now be described in the order in which they may be accessed by tabbing. This is not only easier to follow if a mouse is not available, but it helps to avoid missing an essential parameter. Reference will, however, be made only to mouse operation, e.g. clicking. Users without a mouse should refer to Appendix 1- An Introduction to Windows, which explains the use of access keys, tabbing, space bar, and enter keys to select items.

When the Main Screen first appears, the selected button is “Retrieve Settings”. When standard tests are to be performed regularly it is possible to save the settings which are used. These settings may then be recalled using the Retrieve Settings button, avoiding the need to re-enter all the parameters on each occasion that the test is run. For the purpose of this example it is assumed that no suitable settings are saved, and that the Main Screen parameters will all need to be entered in turn.

The required test standard should be now chosen from the list shown when Test Standard is selected on the menu bar. The current standard is shown on the title bar of the main screen. This determines acceptable parameters for the specimen and test.

The first selection which may be made on the screen is the choice of specimen compliance calculation. The alternatives are to use software calculation based on measured load/displacement, or the P.D. or Potential Drop method which effectively measures the electrical resistance of the specimen during the test. The selection buttons are alternatives - selecting one by clicking on its button will de-select the other. The compliance method is the most commonly used, so it is selected for this example. (*Note: Unless the computer is equipped with the necessary hardware to perform Potential Drop measurements the P.D. button will be inoperative.)*

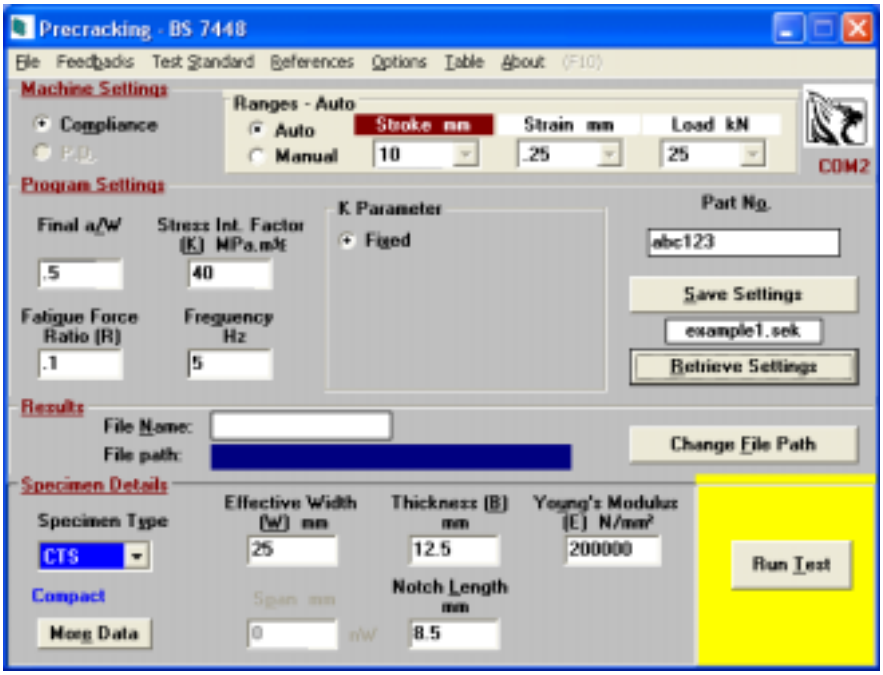


Figure 1. The Main Screen ready to run a test

The working ranges of the machine need to be selected next. The smallest range should be used which will accomplish the test. This will give the best possible resolution and control performance. The user should estimate the required ranges based upon the actual specimen in use, and the ranges available on the control system.

To select ranges, tab to the box below the “Stroke” label (under the “Ranges” label) and use the up and down arrow keys, or click on the box and use the mouse to select a range. The range in use will be highlighted, and initially represents the range selected on the control system, which may not be the range required. Select the stroke range, then tab to the strain and load ranges, setting each in turn.

The Program Settings should be entered next. The “Final a/W” value should be entered first, and is typically set to 0.50, but any value in the relevant range (0.45 to 0.55 for BS 7448) is acceptable.

The next parameter to enter is the “Fatigue Force Ratio”, which is the ratio of minimum divided by maximum force which is applied during the test cycle. A typical value for this is 0.1. The program will vary the mean and cyclic amplitude in order to maintain this value during the test.

The “Stress Intensity Factor (K)” should now be entered. This value is maintained by the software (modified if required by the K Parameter option), along with the Fatigue Force Ratio, as the test progresses and the crack grows.

The “Frequency” at which the specimen is to be fatigued should be entered next. The test is performed using a sinusoidal waveform at this frequency.

The “K Parameter” box provides for maintaining a fixed K value or automatically increasing or decreasing the K value as the crack grows, if allowed by the chosen test standard. “Fixed”, “Increasing” or “Reducing” can be selected with the cursor up/down keys or by clicking with the mouse. If “Increasing” or “Reducing” is selected, then “Final K Value” should be entered followed by “Crack Increment”, which is the change in crack length to be exceeded each time before the K value is automatically adjusted.

Unlike the other parameters shown on the screen the “Part No.” box need not be completed in order to run a test. The box is provided only for convenience, and any batch, job, or part number entered here will be printed at the end of the test.

The “File Name” box in the “Results” section should be completed with a name to be used for the test results file. The file extension should *not* be entered as it is always forced to “**.**dat” (for data). A typical entry in this box might be “example1” to produce an output file called “example1**.**dat”. The full file path is shown below this box.

By default the “**.**dat” results files are placed in the “C:\PS\Results” folder. If you wish to change this, tab to or click on the “Change File Path” button. This will open a dialogue box which will allow the required path to be entered. For this example the path is left unchanged.

In order to run a test the specimen mechanical details must be present. The first information required is the “Specimen Type”. Either Compact Tension Specimens (“CTS”) or three-point bend Single Edge Notch (“SEN”) specimens may be used, as selected from the drop-down box. The specimen dimensions must be entered in the “Width”, “Thickness”, and “Notch Length” boxes. If an SEN type specimen is in use (three-point bend) then the “Span” of the bend fitting will also need to be entered. (If there is any doubt about the orientation or exact meaning of these dimensions, please refer to the relevant standard).

The final specimen detail required is the value of “Young's Modulus” for the material. Once this has been entered the user may click the “More Data” button to open a dialogue box (see figure 5) where further specimen parameters may be entered. These values are required by the Fracture and Analysis Programs, and may alternatively be entered when these programs are run. The values are not required in order to run the Precracking Program, and are provided

here only for convenience, but it is recommended that they are entered at this stage if possible. Full details of this dialogue box and its contents are given in Section 3.

The Main Screen now has all the information required in order to run a test, and to avoid having to enter the values again they should be saved. Click the “Save Settings” button, enter a file name in the “File name:” box, then click “OK”. These settings may now be recalled at a later date. Precracking Program settings are saved with a “.sek” extension.

To run the test click the “Run Test” button. If the results file which has been specified for the test already exists the program will prompt the user to overwrite the old file. Answering “No” will allow the user to return to the Main Screen where the file name may be changed.

For this example answer “Yes” to the file overwrite prompt (if it appears).

The next message will prompt the user to turn the pressure on. At this stage the pump is not running on the machine, so answering “OK” to this message will start it. This prompt is provided as a safety measure to permit anybody close to the machine to be warned that the test is about to start. (If the machine has been left running with pressure already on, this message will not appear.)

The References Table now appears, and may be completed with information about the test and the specimen. None of the references are necessary in order to run the test, they are provided only for record purposes. For this example just click “OK”.

The Run Screen now appears briefly, ready to display the measured parameters as the test progresses. If the integrator is not already on (Digital controller), then a message box will appear asking if it should be turned on. Click the “Yes” button to turn it on. If the adaptive control is not already on (Digital controller), then a message box will appear asking if it should be turned on. This is needed to maintain the correct maximum and minimum load values during the test. Click the “Yes” button to turn it on.

The Specimen Setup pop-up window will then be shown which allows the actuator to be positioned in order to fit the specimen (figure 2). Clicking the button marked ⇳ (or pressing the F9 key) will move the grips apart, while clicking the button marked ⇵ (or pressing the F10 key) will move the grips closer together. In either case the actuator will continue to move at the rate specified in the “Rate” box until the “Stop” button is operated (or the F11 key is pressed). Note that if the actuator is still opening or closing, clicking “OK” only stops the actuator. A second click is necessary to continue running the test. It is also possible at this stage to tare-off (i.e. make the reading zero) the measured value of load.

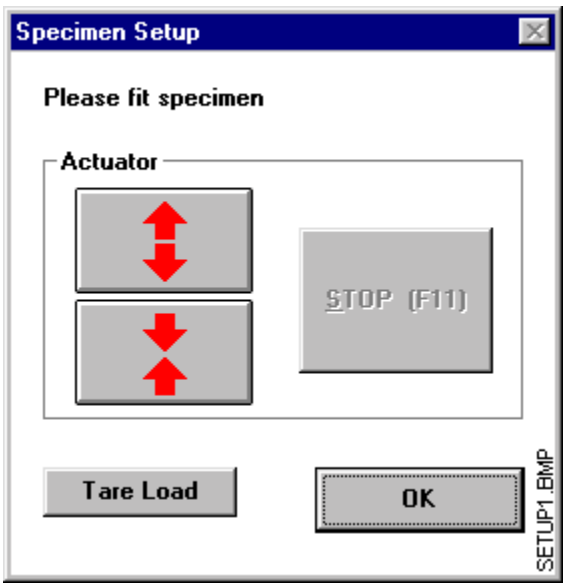


Figure 2. The specimen setup window

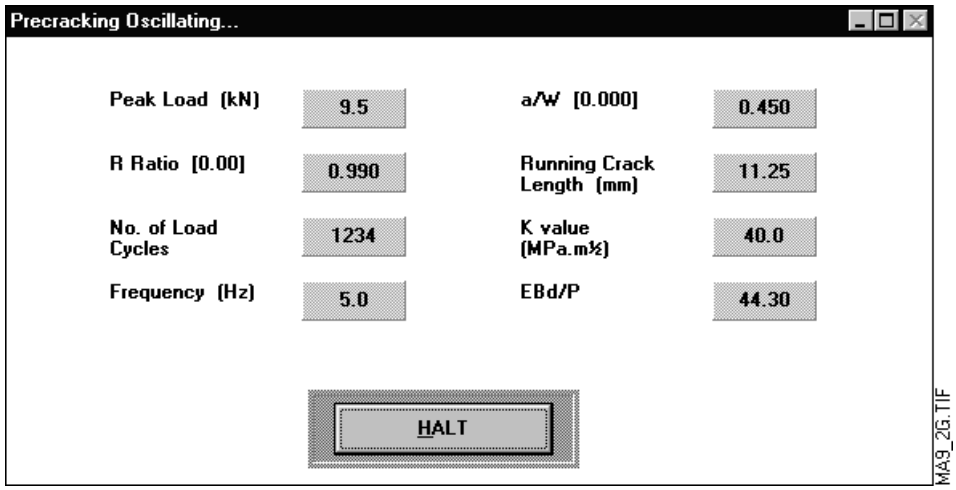


Figure 3. The screen display while a test is running

The next message to be displayed prompts the user to fit the clip-gauge extensometer to the specimen. Clicking the “Cancel” button will abort the test and return to the Main (startup) Screen. Clicking “No” will return to the specimen setup window to allow the actuator to be positioned. Click “Yes” to continue with the test.

The program now returns to the Run Screen (figure 3), on which the test values will be displayed as the crack is grown. Initially no values are shown. Clicking the “Start Test” button will cause the system to ramp to an initial value of load. Once this is achieved, the load value will oscillate at the specified frequency while the amplitude and mean values are varied in order to maintain correct stress intensity and peak force levels. To protect against the

possibility that the specimen is not correctly gripped, if the preload is not achieved within quite fine limits a warning message is displayed. In addition to incorrect gripping, possible causes of the preload not being achieved are that the control system gain is too low, or that the servo valve bias is incorrectly set. If the message does appear, and there is no obvious problem with the specimen which might cause it, ensure that the control system parameters are correctly set. (Refer to the control system instruction manual for information about setting correct gains and bias.)

While the test is running it may be paused at any time by clicking the "HALT" button. The test may then be continued or aborted (which will cause the specimen to be unloaded, and then the program will return to the Main Screen).

The message "*NOT UPDATING*" appearing at any time on the display refers to calculation of specimen compliance. This error message indicates that the load or displacement signals are not large enough. The most likely cause of the problem is that an unsuitable selection of load range has been made. The peak-to-peak variation in load during the test cycle must be at least 20% of the load range in use. For example if the load is cycling between 1 and 11 kN the load range must not be greater than 50 kN. In this case a 20 kN range would be recommended.

While running the test, the values on the display will update regularly as the crack is grown. Once the crack reaches the required size (specified by the "Final a/W" figure), the program displays a message that the test has finished, and requesting that the specimen be removed. Clicking "OK" displays another warning message box which allows the actuator to be returned to the starting position.

The results of the test may be printed either at the normal end of the test, or if the test has been halted by the user. The "**.**dat" results file created during the test may be imported into the subsequent Fracture and Analysis Programs.

3. THE MAIN SCREEN

This section describes the features of the Main Screen in detail (see figure 1), with the exception of the Menu Bar which is dealt with in section 4.

Save Settings and Retrieve Settings

When standard tests are to be performed regularly it is possible to save the settings which are used. These settings may then be recalled using the "Retrieve Settings" button on the Main Screen, avoiding the need to re-enter all the parameters on each occasion that the test is run.

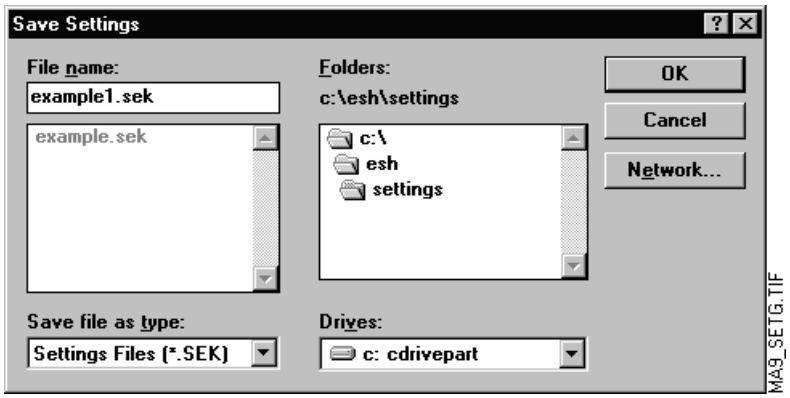


Figure 4. The Save Settings dialogue box.

The Retrieve Settings box is similar.

It is necessary for all parameters, except the Part No. and details on the More Data screen, to be correctly entered before Save Settings can be used.

Clicking the "Save Settings" or "Retrieve Settings" button opens a standard dialogue box (figure 4) which contains four main subsections. The "Drives" and the "Save file as type" boxes both have a down arrow button at their right hand end. Clicking on this button will produce a drop-down list of the available options, and any of those options may be selected by clicking on them. The disk drive which is selected may be seen both within the "Drives" box, and also as part of the full path specified just below the Folders title. (For users who are not familiar with files, folders (or directories) and the way in which they are organised into trees, please refer to your Windows instruction manual.)

The "Folders" box shows part of the tree structure on the drive which has been selected. Only the route to the folder which is open is shown, plus its sub-folders. The folder selection is changed by double clicking on the required folder name. If the "C:\" root folder is selected, all sub-folders in the root folder will be displayed. In this way the required folder may be quickly accessed, and the files within that folder will be listed in the box below "File name".

The box below the "File name" box displays the files within the selected folder which have the extension shown in the "Save file as type" or "List files as type" box. It is normal practice for Precracking Program settings files to be saved with a ".sek" extension. Clicking on one of

the files shown will place that file name in the "File name" box. Alternatively a new file name plus extension may be typed in.

Compliance / P.D.

The determination of specimen compliance is vital to the program to enable it to maintain the correct Stress Intensity Factor (K) at the tip of the crack which is being grown. The "Compliance" option uses software calculation to derive specimen compliance from the measured values of displacement and load. The alternative is the "P.D." or Potential Drop method which effectively measures the electrical resistance of the specimen during the test. The selection buttons are alternatives - selecting one by clicking on its button will de-select the other.

(*Note: Unless the computer is equipped with the necessary hardware to perform Potential Drop measurements the P.D. button will be inoperative.)*

Ranges

The smallest strain and load working ranges should be used which will accomplish the test. This will give the best possible resolution and control performance. The stroke range is less important as actuator stroke is not monitored during the test. The user should estimate the required ranges based upon the actual specimen in use, and the ranges available on the control system. It is essential that the peak-to-peak load cycle exceeds 20% of the chosen range or the compliance calculation may not update (a warning message will appear if this happens).

To select ranges, tab to the box below the mode required (under the "Ranges" label) and use the up and down arrow keys, or click on the box and use the mouse to select a range. The range currently selected on the control system will initially be highlighted.

Final a/W

The "Final a/W" figure is the ratio of crack length to specimen width to which the crack will be grown. For example, this should be between 0.45 and 0.55 for a valid test to BS 7448.

Fatigue Force Ratio (R)

The "Fatigue Force Ratio" is the ratio of minimum divided by maximum force which is applied during the test cycle. The absolute values of load applied during the test are determined by the program to achieve the required stress intensity factor. Only the ratio of forces is specified by the user. A typical value of Fatigue Force Ratio is 0.1.

Stress Intensity Factor (K)

When using the "Fixed K" option the "Stress Intensity Factor" (K) is the value maintained by the program, along with the Fatigue Force Ratio, as the test progresses and the crack grows.

Frequency

The crack is grown by cycling the specimen loading using a sinusoidal waveform at the frequency specified. Any value in the range 1.5 Hz to 100 Hz is permitted.

K Parameter

The "K Parameter" box contains a "**Fixed**" option which means that the test will be performed with a constant value of stress intensity factor maintained by the program as the crack is grown.

The "**Reducing**" and "**Increasing**" options (if applicable) determine what the value of K will be at the end of the precracking and how often the value is changed during the crack growth.

Part No.

Unlike the other parameters shown on the Main Screen, the "Part No." box need not be completed in order to run a test. The box is provided only for convenience, and any batch, job, or part number entered here will be printed at the end of the test.

The Part Number is also shown in the References Table, and may be entered from the References Menu (see Section 4).

File Name

The "File Name" box in the "Results" section should be completed with a name to be used for the test results file. The file extension should *not* be entered as it is always forced to ".dat" (for data).

By default the " .dat" results files are placed in the "C:\PS\Results" folder. If you wish to change this, tab to or click on the "Change File Path" button. This will open a dialogue box which will allow the required path to be entered. An example of a data file is shown in Appendix 2.

Specimen Type

The Precracking Program may be used either with compact (CTS) or three-point bend (SEN) specimens as selected from the drop-down box. If an SEN type specimen is in use then the span of the bend fitting will need to be entered in addition to the specimen width and breadth.

Effective Width (W)

Thickness (B)

Notch Length

For specific details of how these dimensions are defined please refer to the relevant standard as they vary with specimen type. As a general reminder, however, the Effective Width (W) of the specimen is measured in the direction in which the crack is to be grown, the Thickness or Breadth (B) is measured in the direction along the crack tip or notch end.

Span

This parameter may only be entered if a three point bend type specimen is selected, in which case this dimension is the distance between the supporting rollers of the specimen fitting.

Young's Modulus, E

The value of Young's Modulus for the material under test should be entered in this box.

More Data -> Specimen Parameters

Clicking the button marked “More Data” opens a pop-up window with further specimen parameters. All of these values are optional within the Precracking Program, (although they are essential to the Analysis Program) however the user is recommended to enter them into the Precracking Program if possible.

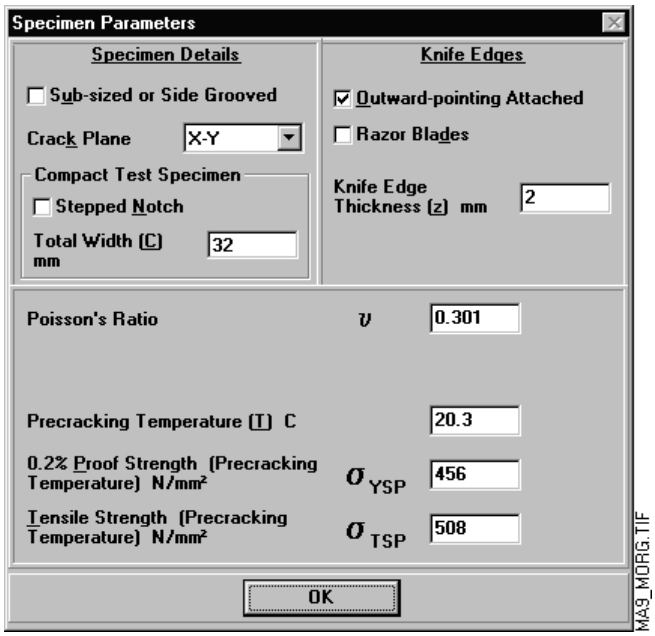


Figure 5. The "More Data" specimen parameters screen.

Run Test

The test may be run only if the Main Screen parameters have all been entered (only “Part No.” is optional). If the screen is incomplete or an invalid parameter has been entered a suitable warning message will be displayed when the “Run Test” button is clicked, and the test will not be run.

4. THE MAIN SCREEN MENU BAR

The following section describes the features to be found on the pull-down menus at the top of the Precracking Program Main Screen (figure 1).

Users who wish to access the menu bar without a mouse should note that the "Alt+key" access keys which may be used within the main part of the screen do not give access to the menu bar. To reach the menu bar use the function key F10. Once the menu bar is reached, the menu selection may be made either by pressing a short-cut key (e.g. F to access the File menu) or by using the cursor keys.

File menu

The "File" drop-down menu contains only one option, which is "Exit". This closes the program

Feedbacks menu

Clicking on the "Feedbacks" menu displays a window with the stroke, strain and load feedbacks in real-time. This facility is mainly provided as a quick visual check that system connections are correctly made, or that the actuator has been positioned as required during test setup.

To remove the Feedbacks display window simply click the "OK" button (or press SPACE or ENTER).

(Note that the control system displays feedbacks and maximum measured values at different rates to the computer display, therefore there will sometimes be differences between the two displays, especially if the values are changing. The difference between the displayed values for steady-state conditions should not exceed the tolerances permitted during calibration of the equipment. If the difference is outside tolerance levels the board within the computer may be adjusted. The control system data acquisition system may not be adjusted.

It is important to realise that any monitoring or test equipment connected to the control system Transducer Monitor BNC connectors should have input impedances in excess of 50k ohms as low impedance devices may corrupt the readings obtained by the computer.)

Test Standard menu

The "Test Standard" menu allows the user to select which standard the test is to be performed with. Choices include BS 7448, ASTM E 399, ASTM E 647 and ASTM E 813. This governs what range of values for certain parameters are acceptable and what type of specimen may be used.

References menu

The "References" table contains important test details such as material specification etc. which may be entered by the user and printed with the results at the end of the test. To enter values into the table, select the "Setup" option from the References menu. This will open the table for text entry. When the values have been entered, click the "OK" button. Entering any information into the References table is optional.

To print a copy of the References table to the printer, select the “Print” option from the References pull-down menu.

Options menu -> Preferences -> Loading Rate

The “Loading Rate” (normally entered in units of kN/s) is the rate at which the specimen is loaded to the mean value during the initial part of the test. It is also the rate at which the specimen is unloaded.

Table menu

The “Table” menu displays the f '(a/W) table for CTS, or the f (a/W) for SEN specimens. This table is used by the precracking test, but does not require any user input and is provided only for reference. The option is provided to print the table. The EBd/p value is also shown for reference.

About menu

The “About” menu displays a box containing the Precracking Program version number, as well as information to help the user to contact Phoenix Calibration and Services in the event of a query.

5. APPENDIX 1 - AN INTRODUCTION TO WINDOWS

All Phoenix Calibration & Services applications programs are designed to run within the Windows environment on an IBM compatible personal computer. This instruction manual does not assume a working knowledge of Windows, however the user is urged to read the Windows documentation for complete information, as only the basic details are given here. For users new to the Windows environment the following is a glossary of important terms used:-

Mouse pointer - a pointing device on the screen which is moved using the mouse. Most operations within Windows are achieved by pointing to parts of the screen and pressing the buttons on the mouse. The shape of the mouse pointer will change as it points to different objects. The normal pointer is an arrow which points upwards and slightly left. When the pointer is placed in a text entry box it changes to an I-beam (similar to a capital I). When the computer is performing some action which requires it to suspend mouse operation temporarily (when reading or writing a file to disk for example), the pointer changes to an hour-glass.

Click - the action of pressing the mouse buttons is usually known as “clicking”, not “pressing”, as it is a momentary press (click) which is usually used. The expressions “left click” or “right click” refer to clicking the left or right buttons on the mouse. Most operations use the left mouse button, so “click” usually means left click.

Double-click - is to click the mouse button twice in quick succession. This is a specific action quite distinct from clicking the mouse button twice with an interval between. If the user has difficulty in clicking fast enough, the double-click response speed may be changed from within the Windows Control Panel. Please refer to your Windows manual.

Edit cursor - also known as the **Insertion Bar**. Entering text or numerical values is often achieved by placing the mouse pointer over the box where the parameter appears, then selecting the value for editing by left clicking. This places an edit cursor at the point where the editing will take place. The edit cursor is in the form of a vertical flashing bar. The backspace and delete keys may be used while editing.

Tabbing - instead of pointing and clicking on parameter entry boxes or buttons using the mouse, it is possible to use the tab key to make a selection. Tabbing selects the parameters in a repeating sequence, and using Shift+Tab reverses the sequence. The item which is selected is identified either by the presence of the edit cursor, or by a dotted box. If the selected item is a button it may then be operated by pressing the space bar on the keyboard. Regardless of the selection there is usually a button which has a bold outline. This is known as the **Default Button** and may be operated by using the ENTER key even when it is not currently selected.

Greyed-out - when the operation of a button is inhibited for some reason its colour and outline are made grey. Clicking on a greyed-out button will not cause it to operate.

Access keys - A title or label may have one character underlined. The keystroke Alt+character will select the parameter, for example to select a box titled “Mode”, press the M key while holding down the Alt key. Some types of data entry box contain a button with a downward pointing triangle (▼) This may be operated by pressing Alt+down-arrow which

will open a drop-down box of possible options for that parameter. The up and down arrow keys may then be used to highlight an option which is then selected by tabbing away from the box or pressing Alt+down-arrow again.

Menu bar - at the top of the working window is a strip (bar) containing menu names. If the mouse is positioned on one of the menu names and the left button clicked, a drop-down menu appears. To select an option from a drop-down menu, click on the option. Alternatively, place the mouse pointer over the menu to select it, press the left mouse button and hold it down while pulling the mouse down to the required option. The option is selected when the mouse button is released.

Short-cut keys - the menus on the menu bar also have underlined characters, but are not accessed using the "Alt+character" method. Instead, pressing F10 will select the menu bar, then the underlined short-cut keys or the left and right cursor keys may be used to select the required menu. Short-cut keys select and open a menu directly, the cursor key method requires the ENTER key to be pressed to open the selected menu. Once open, use the up or down cursor keys to make a selection (followed by ENTER), or just press an underlined short-cut key. To cancel the selection process press the escape key.

6. APPENDIX 2 - AN EXAMPLE RESULTS FILE

The following is an example of a ".dat" results file generated by the Precracking Program:-

"Precracking"
"5919 v3.3"
"EXAMPLE1.DAT"
"19/01/98"
5,19,25 *(For Phoenix Services use)*
"Number 1"
"Test Ref."
"Description"
1 *(Quantity)*
"Order No."
"Material Spec."
"Heat Treatment"
"Code Mark"
"Remark 1"
"Remark 2"
"Remark 3"
"Remark 4"
"Test Standard:"
"BS 7448"
"Specimen Type:"
"CTS"
"Design Type:"
"Compact"
"Effective Width (W) mm:"
26
"Thickness (B) mm:"
12
"Span (not applicable) mm:"
0
"Notch Length mm:"
9
"Requested Final a/W:"
.5
"Requested R Ratio:"
.1
"Requested Initial K Factor:"
40
"Fixed"
"" *(Final K Factor:)*
""
"" *(Crack Increment:)*

“”
“Precracking Frequency Hz:”
10
“Sub-sized or Side Grooved:”
“No” *(false)*
“Crack Plane:”
“X-Y”
“Stepped Notch:”
“No” *(false)*
“Total Width (C) mm:”
32.5
“Outward-pointing Attached Knife Edges:”
“Yes” *(true)*
Razor Blades:”
“No” *(false)*
“Knife Edge Thickness mm:”
2
“Poisson's Ratio:”
.3
“Precracking Temperature:”
20
“Young's Modulus:”
210000
“0.2% Proof Strength (Precracking Temperature):”
480
“Tensile Strength (Precracking Temperature):”
500
“RESULTS”
“Final a/W:”
.502
“Final Crack Length:”
13.049
“Final Compliance (mm/kN):”
.02273
“Final K Factor:”
40
“Final Peak Load (kN):”
12.29
“Final R Ratio:”
.097
“Final Cycle Count:”
16252

Notes

Phoenix Calibration & Services Ltd
Brick Kiln Street, Harts Hill, Brierley Hill,
West Midlands, DY5 1JG,
UNITED KINGDOM
Tel. No. +44 (0)1384 480545
Fax No. +44 (0)1384 480602
E-mail: sales@phoenixcalibration.co.uk
Web site: http://www.phoenixcalibration.co.uk